

The Role of War-Zone Trauma and PTSD in the Etiology of Antisocial Behavior

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Abstract: Historically, successful reintegration of war veterans into civilized society has been an enduring concern of nations. Data from the National Vietnam Veterans Readjustment Study were used to develop and evaluate an etiological model of postwar antisocial behavior. Two initial models specified causal paths among five sets of variables, ordered according to their historical occurrence: (a) premilitary risk factors, (b) military traumas and disciplinary actions, (c) the homecoming reception, (d) postmilitary PTSD and substance abuse, and (e) postmilitary antisocial behavior. PTSD and substance abuse were omitted in one model and included in the other. The initial models were refined and then cross-validated, leading to the specification of replicated models with highly satisfactory fit and parsimony. Comparison of the two models suggested that (1) premilitary experiences and behavior exert the largest effects on postmilitary antisocial behavior, and that (2) PTSD plays a necessary mediational role for the effects of war-zone traumatic exposure on postmilitary antisocial behavior.

Key Words: Antisocial behavior, posttraumatic stress disorder, trauma, veterans.

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The United States, like other countries, has historically been apprehensive about its returning warriors (Leventman, 1978; Waller, 1944; Wecter, 1944). Even when they have been victorious, their return has engendered doubts about the prospects of their adaptive reintegration into civilized society. The latent fear has been that the loosening of constraints on their antisocial behavior would persist.

Clinical and empirical studies of the postwar adjustment of Vietnam veterans have examined the relationship of postmilitary antisocial behavior to premilitary antisocial be-

havior, traumatic exposure during the military, and PTSD. For the most part, these studies suggest that postmilitary antisocial behavior is significantly associated with premilitary antisocial behavior (Resnick et al., 1989; Yesavage, 1983). Additionally, both atrocities and intensive combat exposure have been found to be associated significantly with postmilitary antisocial behavior (McFall et al., 1999; Resnick et al., 1989; Yager et al., 1984; Yesavage, 1983). Finally, PTSD has been reported, in several studies, to be associated significantly with postmilitary antisocial behavior (Collins and Bailey, 1990; Feldmann, 1988; Wilson and Zigelbaum, 1986). In fact, PTSD has been accorded a status similar to substance abuse as a risk factor for antisocial behavior by some (*cf.*, Hodgins, 1993).

Taken as whole, these studies suggest that premilitary antisocial behavior and traumatic exposure in the military result in postmilitary antisocial behavior, and further, that this effect may be mediated by PTSD. There are several limitations to the available studies, however, that preclude drawing these conclusions definitively, including small and selective samples, not controlling for substance abuse or for a previous history of antisocial behavior, and a looseness between the description of the statistical analyses in associational terms and the interpretation of the results in causal terms.

We examine the question of the etiology of postmilitary antisocial behavior in a way that addresses each of these limitations. First, we use data from a national community sample of 1200 Vietnam theater veterans available from the National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al., 1990a). Second, we include measures of premilitary antisocial behavior and postmilitary substance abuse so that these variables can be not only controlled but also evaluated for their contributions in addition to traumatic war-zone exposure and PTSD. Third, we specify two models of causality, one without PTSD and substance abuse and one with these variables included to clarify the mediational role played by PTSD and substance abuse.

We use structural equation modeling to model the etiology of postmilitary antisocial behavior (*cf.*, James et al., 1982). In this approach, total effects can be partitioned into those that are direct or unmediated by any other variable and

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those that are indirect or mediated by one or more other variables. It is important to note that structural equation modeling cannot alter the limitations of associational data in demonstrating causation. It can, however, provide an indication of the degree to which a set of causal propositions fits the empirical associations in the data. All causal interpretations to be made of the data, therefore, are specified in advance and are evaluated simultaneously as a set.

The variables that we include in our models are those that were found previously to play a prominent contributory role in a model of the etiology of PTSD among male veterans in the community (Fontana and Rosenheck, 1994). We have assigned causal priority according to the following temporal ordering of the variables: (1) premilitary risk factors, (2) traumatic exposure and disciplinary actions in the military, (3) the homecoming reception, (4) PTSD and substance abuse, and (5) antisocial behavior. A noncausal association between PTSD and substance abuse has been modeled because they both refer to the postmilitary period.

METHODS

Sample

The NVVRS includes a national sample of 1198 male Vietnam theater veterans selected from a computerized military personnel registry. Veterans averaged 40.1 (SD = 5.3) years of age, with 13.4 (SD = 2.4) years of education. Ethnically, 48.9% were white, 26.8% were black, 22.9% were Hispanic, and 1.4% were of other ancestry. In terms of their marital status, 71.3% were married, 21.3% were divorced or separated, and 6.8% had never been married. Twenty-one percent of the sample was suffering from PTSD at the time of the survey, which was conducted from 1986 to 1988.

For analytic purposes, the sample was divided into two random subsamples of 599 each. The subsamples did not differ significantly on any of the background or model variables. Only veterans with complete data were included in the analyses. Therefore, there were 557 veterans in the analyses for the first subsample and 560 veterans in the second.

Measures

Premilitary risk factors are represented by five variables.

(1) Childhood physical or sexual abuse is a dichotomous variable that was determined from the list of traumatic events and explicit physical abuse such as "physical assault, torture, rape, abuse, mugging or similar assault (not war-related)" that involved the veteran as a victim and that occurred before he was 18 years old. In addition, a veteran's report that as a child he had been spanked or hit "hard enough that [he] had marks or bruises, had to stay in bed, or see a doctor" was coded positive for abuse ($M = .22$, $SD = .41$, range = 0–5).

(2, 3) Ethnic minority status was measured dichotomously as two variables: black (27%) and Hispanic (23%).

(4) Eleven behaviors indicative of a conduct disorder before the age of 15 were taken from the list compiled by Helzer (1981) such as playing hooky, being suspended or expelled from school, being arrested or sent to juvenile court, running away from home, lying, drinking or using drugs, stealing, destroying property, and starting fist fights ($M = 1.77$, $SD = 1.85$, range = 0–11).

(5) Family instability was measured by the Family Stability Scale (Kadushin et al., 1981). It is the sum of 11 dichotomous items covering experiences before the age of 18 such as parental separation, divorce or death, living in a foster home or orphanage, father out of work, and family income below the poverty level ($M = 2.66$, $SD = 1.76$, range = 0–10).

War-related traumatic exposure and disciplinary actions received in the military are represented by three variables.

(6) Combat is measured by two scales: the Revised Combat Scale (Laufer et al., 1981; $M = 7.71$, $SD = 4.38$, range = 0–14) and the Combat Exposure Scale (Keane et al., 1989; $M = 19.45$, $SD = 11.97$, range = 0–56). These scales measure traditional aspects of warfare that have been considered necessary and appropriate to the legitimate goals of war. They correlated .78 with each other in the present study. Therefore, combat was generated in the model as a latent variable to represent this category of traumatic exposure.

(7) Participation in abusive violence (32%) was determined from several questions asking whether the veteran participated personally in situations in which American or South Vietnamese troops terrorized, wounded, or killed civilians; tortured, wounded or killed prisoners or hostages; or mutilated enemy or civilian bodies. Because of the overlap among these questions, we coded participation as a dichotomous variable.

(8) Having received a disciplinary action (36%) was coded dichotomously from questions asking whether the veteran ever received restriction to quarters, loss of pay, demotion, an Article 15, or a court-martial.

The homecoming reception is represented by two variables.

(9) Society's reception is measured as the sum of three questions (coefficient $\alpha = .79$) concerning the extent to which the American people made the veteran feel at home again, respected him for having served in the armed forces, and made him feel proud to have served in the armed forces ($M = 8.83$, $SD = 3.31$, range = 3–15). Reception was coded in the negative direction, with high scores representing a rejecting reception.

(10) The family's support is measured by two scales, both of which were coded in the direction of low support. The unavailability of instrumental and emotional help is the sum

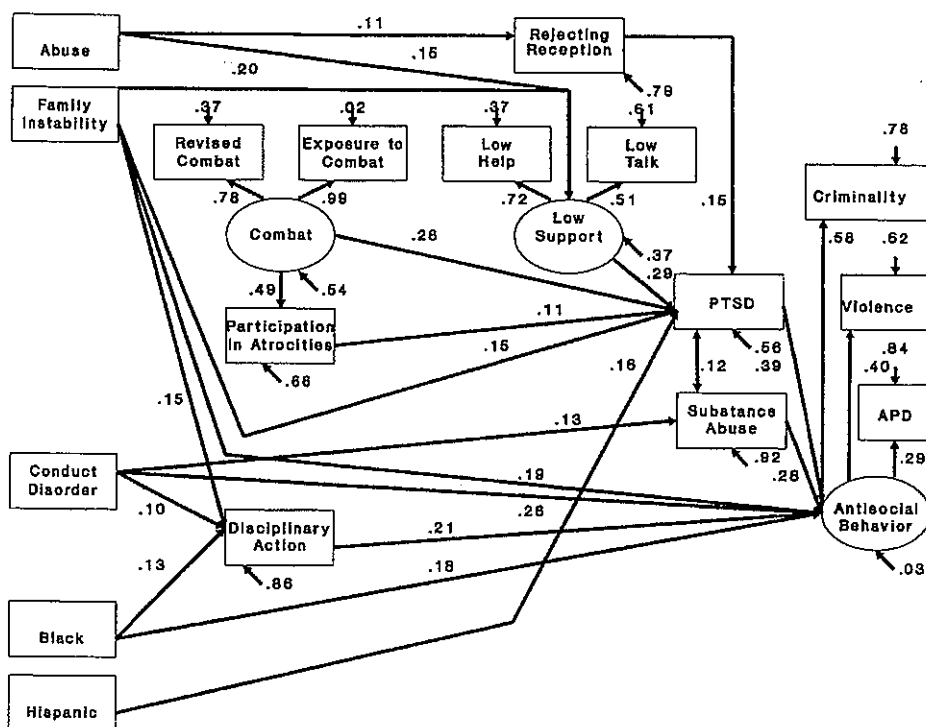


FIGURE 1. Initial model for antisocial behavior, excluding PTSD and substance abuse.

of four questions (coefficient $\alpha = .78$; $M = 1.55$, $SD = 1.06$, range 1–5), and the unavailability of someone to talk to and confide in at the time of homecoming is the sum of three questions (coefficient $\alpha = .64$; $M = 3.70$, $SD = .96$, range = 2–6). Low help and low talk were correlated .48 with other, so a latent variable of low support was generated in the model.

Psychiatric disorders are represented by two variables, PTSD and substance abuse.

(11) PTSD is measured by the predicted probability of being diagnosed with current PTSD as computed by the NVVRS. This variable was derived by optimizing the prediction of PTSD, as determined by psychiatric interview in a clinical subsample, from other variables that were available in both the clinical subsample and the total survey sample (Kulka et al., 1990b; $M = .21$, $SD = .32$, range = 0–1). The resulting logistic regression equation from the clinical subsample was then applied to the same variables in the survey sample to generate the probability of being diagnosed with PTSD. This variable is the basis for the estimates of prevalence generally cited from the study.

(12) Substance abuse was derived from the Diagnostic Interview Schedule diagnoses of alcohol abuse/dependence and drug abuse/dependence (Robins et al., 1981) during the preceding 6 months (14%).

(13) A latent variable of postwar antisocial behavior was generated by the model from three components: Diagnostic Interview Schedule diagnosis of current antisocial

personality disorder (3%); a four-level index of criminality since age 18, in which no involvement = 1, arrested or jailed once = 2, arrested or jailed more than once = 3, and convicted of a felony = 4 ($M = 1.61$, $SD = .93$, range = 1–4); and a five-level index of violent behaviors during the past year, in which none = 1, one or two instances = 2, three to five instances = 3, six to 12 instances = 4, and 13 or more instances = 5 ($M = 2.17$, $SD = 1.43$, range = 1–5). Violent behaviors included pushing, grabbing, slapping, kicking, biting, or hitting someone, or threatening with or actually using a knife or gun on someone. The decision to model these three components in terms of an underlying dimension of antisocial behavior rather than each behavior separately rested on two considerations. One is that they were all correlated moderately with each other ($r = .16$ –.26), and the second is that there was a great similarity in results when each was modeled separately.

Data Analyses

The whole sample was divided into two random subsamples so that the most inclusive temporal schema could be modeled on the first subsample. Then the model could be reduced based on the results from the first subsample, and cross-validated on the second subsample. This approach was used both for both the initial and expanded models.

Initially, each historical set of variables was hypothesized to contribute to each subsequent set. Within war-zone experiences themselves, we hypothesized that combat expo-

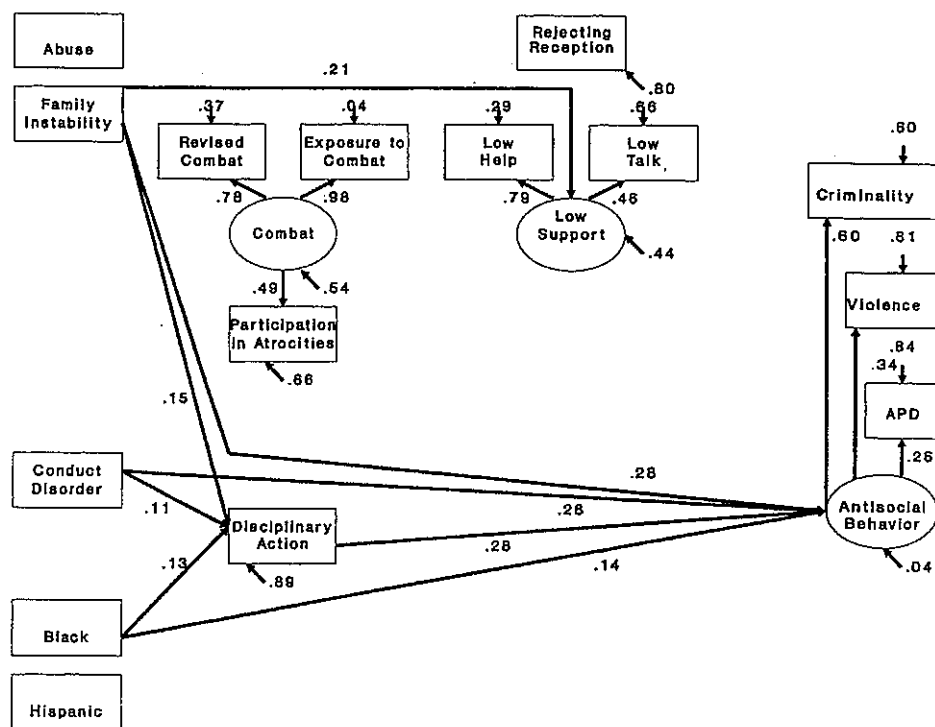


FIGURE 2. Expanded model of anti-social behavior, including PTSD and substance abuse.

sure resulted in the opportunities for participating in abusive violence. Then the model was reduced by specifying only those paths for estimation that were significant. Finally, a model that specified only those paths that were significant in both subsamples was evaluated for adequacy as the most preferable model. Parameters for the final model were estimated from the total sample to generate the most stable and representative values.

Statistically, the adequacy of a model can be judged from its fit and its parsimony. *Fit* refers to the extent to which the values estimated by a model correspond to the actual values in the data set. In the extreme, where the maximum number of parameters is estimated, fit is necessarily perfect and is therefore meaningless. What is desirable, therefore, is to achieve a high degree of fit with the estimation of as few parameters as possible. In this way, the parsimony of the model is optimized. For fit, we selected Bentler's (1990) comparative fit index (CFI). The CFI is an improvement on the earlier normed fit index (Bentler and Bonett, 1980) by virtue of the elimination of its sensitivity to sample size. For parsimony, we have selected the parsimonious fit index (PFI; James et al., 1982). The PFI is essentially an adjustment of the normed fit index for the degrees of freedom used to attain the fit.

Each overall model is composed of a measurement model and a structural equation model. The measurement model generates latent variables that are assumed to underlie and to give rise to specific observable indicators that can be

measured. The structural equation model specifies the causal paths that are posited to exist between exogenous and endogenous variables and among the endogenous variables themselves. In the present model, the five premilitary variables (childhood abuse, family instability, conduct disorder, and black and Hispanic ethnicity) are exogenous variables whose theoretical interrelationships lie outside the scope of the model. Noncausal associations among the exogenous variables were included in the statistical evaluation of the model, but these associations are not diagrammed in the figures.

A check of the data for outliers failed to reveal any case in need of deletion. Examination of the multivariate kurtosis (Mardia, 1970) of the subsamples revealed that each was substantially more peaked than normal. Therefore, we used generalized least squares for the method of model parameter estimation (SAS Institute Inc., 1990). The final models are diagrammed in Figures 1 and 2. The bidirectional arrow between PTSD and substance abuse indicates an association between the two variables that is not specified for causality. The small arrows that are attached to each variable but do not proceed from another variable indicate the disturbance (that is, the proportion of variance unaccounted for by the model) associated with each variable.

RESULTS

Generalized least squares estimation was performed on the variance-covariance matrices of the model variables. The final version of the initial model achieved a high degree of fit

to the data ($CFI = .980$) with a substantial degree of parsimony ($PFI = .723$). Expansion of the initial model by inclusion of PTSD and substance abuse was also achieved with a high degree of fit ($CFI = .983$), and at only a slight cost in parsimony ($PFI = .702$). These indices indicate that the initial and the expanded models are equally adequate statistically and that there is little basis for choosing between them on statistical grounds.

Initial Model

Significant paths for the initial model are diagrammed in Figure 1. The disturbance term for antisocial behavior is .04, indicating that the model accounts for 96% of the variance in the underlying dimension that is common to all three components. The measurement model indicates that the latent variable, combat, is highly saturated with the variance from both combat scales, with loadings of .78 and .98. The latent variable, low support, is moderately saturated with variance from its manifest indicators, with loadings of .79 and .46. Antisocial behavior is somewhat less saturated, with loadings of .60, .34 and .26, with the strongest component criminality.

Significant paths leading to antisocial behavior were found proceeding from three premilitary risk factors: family instability, conduct disorder, and black ethnicity. Another significant path to antisocial behavior proceeded from receipt of a disciplinary action while in the military. Moreover, the three premilitary factors all contributed significantly to receiving a disciplinary action. There were no significant paths from either traumatic military exposure or the homecoming reception to postmilitary antisocial behavior.

Expanded Model

Significant paths for the expanded model are diagrammed in Figure 2. The disturbance term for antisocial behavior is .03, indicating that the expanded model accounts for 97% of the variance in the underlying dimension. The latent variables of combat, low support, and antisocial behavior here and in the initial model were generated similarly.

The same pattern of significant paths as in the initial model emerged among family instability, conduct disorder, black ethnicity, disciplinary action, and antisocial behavior. In addition, however, significant paths proceeded from PTSD and substance abuse to antisocial behavior. Further, both combat exposure and participation in abusive violence, and a rejecting reception by society and low support from family and friends, contributed to the development of PTSD. In addition, significant paths proceeded from family instability and Hispanic ethnicity to PTSD. It is noteworthy that none of the variables contributing to PTSD also contributed to substance abuse, even though there was a significant positive association between PTSD and substance abuse. In fact, the only factor contributing to substance abuse was conduct

disorder, one of the components of which was premilitary substance use. Finally, none of the premilitary risk factors made a significant contribution to traumatic military exposure. Both family instability and abuse, however, contributed to low support from family and friends, and abuse contributed to experiencing a more rejecting reception from society.

Comparison of Effects

The amount of variance in antisocial behavior accounted for by the initial and expanded models is very similar, differing by only 1%. Therefore, a comparison of the effects on antisocial behavior between the two models is instructive primarily to see how the effects are distributed among the variables. In the initial model, 100% of the total effects are attributed to the four variables family instability, conduct disorder, black ethnicity, and disciplinary action. These same four variables account for 45% of the total effects in the expanded model. Of the remaining effects (55% of the total), 30% are attributed to PTSD and substance abuse, 9% to combat exposure and participation in abusive violence, 11% to a rejecting homecoming reception and low support, and 5% to Hispanic ethnicity and childhood abuse. The expanded model, then, allows for the redistribution of explanatory variance to additional variables that otherwise had been subsumed by the four variables in the initial model.

DISCUSSION

The large size of the NVVRS data set enabled us to use a two-stage process of model development in which a model was first examined, then refined, and finally cross-validated. The final model is robust in that it consists of causal propositions that are both replicable and nonredundant. As mentioned, causal modeling does not prove causality but evaluates the degree to which causal propositions are tenable given the associations in the data. With this caveat in mind, we draw the following conclusions regarding the etiology of postmilitary antisocial behavior. Both the initial and expanded models support the conclusion that, for the most part, postmilitary antisocial behavior represents the current manifestation of a lifetime history of antisocial behavior far more than it reflects the aftereffect of war zone stress. Antisocial behavior in the form of a conduct disorder in childhood is manifested in the military as behavior provoking disciplinary action, and both of these historical behaviors are manifested after the military as current antisocial behavior. This behavior pattern is either elicited or reinforced by the disruptive effects of family instability during childhood and the disadvantages encountered by being black in American society.

Although traumatic military exposure and a rejecting and nonsupportive homecoming reception are each related to postmilitary antisocial behavior bivariately, they do not exert a substantial influence on antisocial behavior when considered in the context of other variables and in the absence of

PTSD. It is only when PTSD is introduced into the explanatory picture that traumatic war-zone exposure and the homecoming reception are revealed to play a role, albeit an indirect one that is of modest proportions. It is only through their contribution to the development of PTSD that their etiological influence is realized. To evaluate the possibility that other psychiatric disorders might play a mediating role that subsumes PTSD and substance abuse in the connection of war-zone stress to antisocial behavior, we tested an additional model in which a dichotomous variable was included to represent psychiatric disorder other than substance abuse or PTSD (Robins et al., 1981). Inclusion of this variable did not affect the significance of the paths from either PTSD or substance abuse to antisocial behavior.

The argument for substance abuse as a contributor to antisocial behavior rests on two main points. It is reasonable to assume that intoxication would impair both veterans' judgments of the appropriateness of certain behavior and their inhibition of inappropriate behavior. Further, the need for money to purchase substances and the illegality of obtaining drugs might well be expected to lead to criminal behavior.

With regard to PTSD, the expanded model shows clearly that it is influenced significantly by both traumatic war-zone exposure and the nature of the homecoming reception. Both combat exposure and participation in abusive violence contributed to the development of PTSD.

Of particular note is the substantial role that lack of support from family and friends at the time of homecoming has on the development of PTSD (e.g., Elder and Clipp, 1988; Fontana and Rosenheck, 1994; Johnson et al., 1997; Solomon and Oppenheimer, 1986; Stretch, 1986).

We believe that the homecoming reception is a critical set of events in determining whether acute stress reactions are either diminished to subclinical intensity or are preserved undiminished to become recognized at some later point as PTSD (cf., Parsons, 1988; Smith, 1986). An accepting reception by society and/or significant others confers their endorsement of the legitimacy and justifiability of veterans' wartime actions. A rejecting reception, on the other hand, conveys their condemnation of veterans' wartime behavior, confirming the latter's own doubts concerning the legitimacy and justifiability of their actions. Under these circumstances, acute stress reactions become repetitive and persistent PTSD symptoms. As time passes, veterans make dysfunctional accommodations in their lives to try to cope with the persisting symptoms. In spite of its strong contribution to PTSD, the contribution of a rejecting homecoming to postmilitary antisocial behavior is indirect and of lesser magnitude than that of premilitary factors.

Also of interest in the expanded model is the lack of significant influence of both traumatic military exposure and the homecoming reception on substance abuse. The only significant premilitary or military contributor to substance

abuse is childhood conduct disorder, which has substance use before the age of 15 as one of its components. Even though substance abuse is associated with PTSD, it does not seem to be caused by the same factors.

Before concluding, it is important to acknowledge the inherent limitation of the retrospective nature of these data. Even when variables can be ordered unambiguously in terms of their historical occurrence, it is possible that a retrospective reporting bias might have affected the associations among them. The extent of such effects is unclear. For example, some studies have found that the frequency of reported traumatic events increased over time and that the increase was correlated significantly with severity of PTSD symptoms (e.g., Roemer et al., 1998; Southwick et al., 1997), whereas other studies have failed to find such effects (e.g., Bramsen et al., 2001; Krinsley et al., 2003). Moreover, in two studies, it was found that even when reports of trauma were elevated subsequently, the rank order of their severity was preserved (Goodman et al., 1999; Norris and Kaniasty, 1992), suggesting that the associations among variables would not be affected. In any case, the retrospective nature of the data introduces a caveat to the veridicality of causation as it has been modeled and supported empirically in the present study.

In conclusion, we believe that our models have value from three perspectives. First, they indicate that premilitary experiences and behavior exert the largest influence on postmilitary antisocial behavior. Second, they indicate the unlikelyhood that traumatic war-zone exposure, in and of itself, causes postmilitary antisocial behavior, instead highlighting the crucial mediational role played by PTSD between war-zone exposure and postmilitary antisocial behavior. Finally, they provide a heuristic framework for progressively filling in the missing pieces in the etiology of antisocial behavior as more research findings and more inclusive data become available.

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